MECHELECIV

THE STUDENTS MAGAZINE • VOL. 28 • NOVEMBER 1969 • NO. 2
MEMBER OF ENGINEERING COLLEGE MAGAZINES ASSOCIATED

THE GEORGE WASHINGTON UNIVERSITY

SCHOOL OF ENGINEERING AND APPLIED SCIENCE

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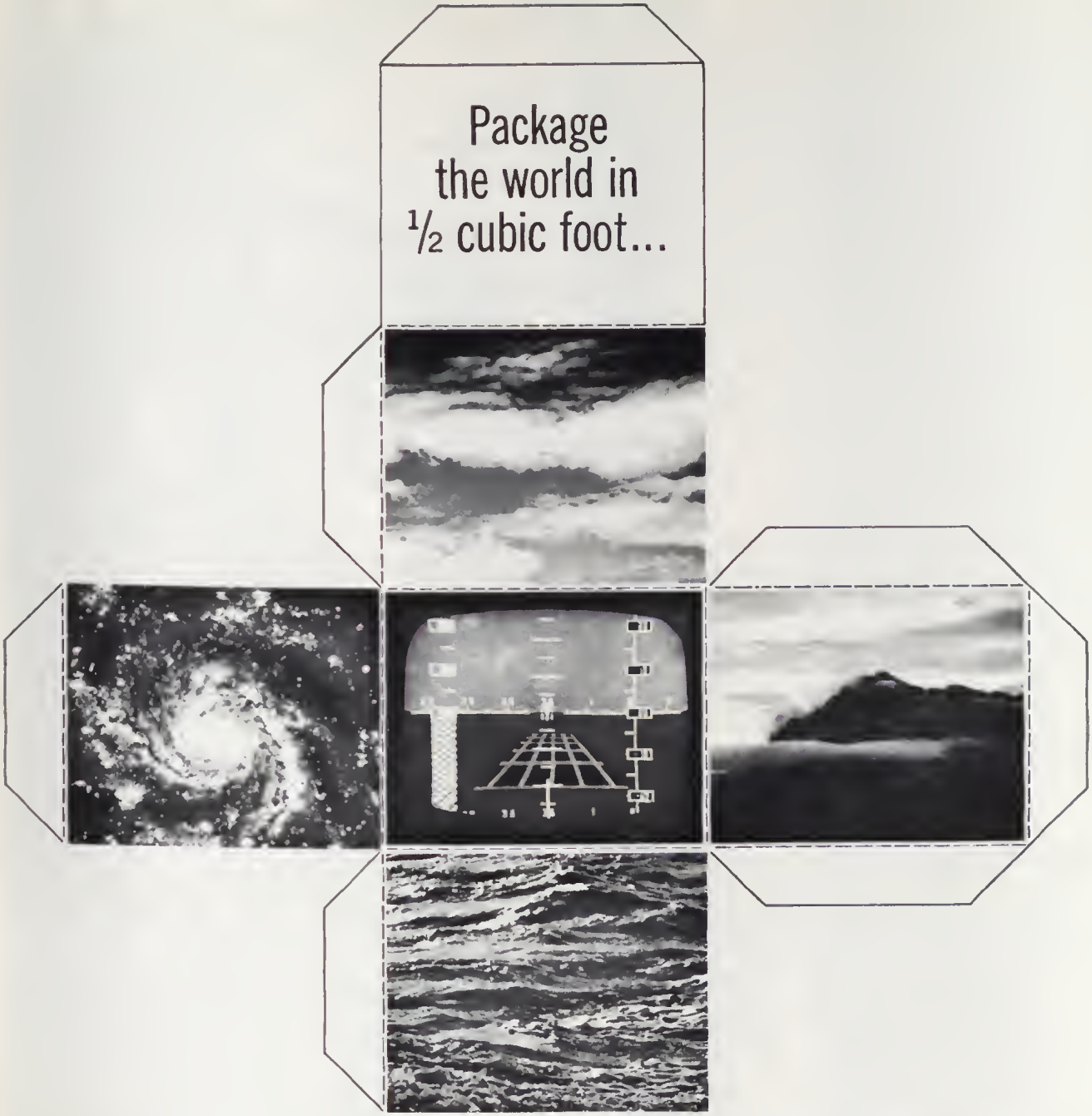

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COVER
Focus on the student engineering magazine

Photo by D.R. Armstrong

FRONTISPIECE
This photograph shows the roots of a turbine blade as they fill in the turbine wheel. Both parts are made of plastic illuminated with polarized light so that the mechanical engineer may determine the areas where the parts would be most likely to fail.

Photo courtesy of The General Electric Company

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Oklahoma State University

Published at the George Washington University by direction of the Engineers' Council. Published six times during the school year in October, November, December, March, April, and May. Circulation: 4000 copies. Second class postage paid at Washington, D.C. Address communications to Mechelociv Magazine, Davis-Hodgkins House, George Washington University, Washington, D.C. 20006, or telephone 676-6726.

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MECHELECIV

Engineering Communications . . . ever heard of this course? Probably not, but it is something that the SEAS lacks and it has become a serious problem not only at the SEAS but at Engineering Colleges all over the country.

We are all aware of the Johnson Credibility Gap. A similar gap in communications exists today between the well-meaning engineer and the unwary public. The engineer is literally struck dumb when it comes to communicating his thoughts to others. He is at such a loss when it comes to writing that he usually abandons it altogether, or turns to the "technical writer" to communicate his thoughts.

While a technical writer can be taught to read computer print-outs, data from lab note-books, and the endless amount of mathematical and engineering symbols and jargon; he cannot interpret results, piece together the engineers' observations, detect subtle implications and make recommendations on those findings. The engineer must explain these things to the technical writer. Hence, there is a tremendous need for engineers who can express themselves clearly.

The cause of the engineers' self-imposed silence goes back before the engineer entered college. The manner in which English is taught to the student in the majority of America's grade and high schools makes it next to impossible to salvage a potentially good writer by the time he reaches college.

Tragically, the great majority of todays Engineering Schools have either eliminated the requirement for a course in English altogether, or have forced the unfortunate freshman engineering student to take the archaic form of Freshman English offered by the University's English Department. These courses simply reinforce the engineering students' hatred for and fear of written English. These courses are simply unsuited for today's technical needs.

What should be done? Simply that we desperately need a practical course in Engineering Communications. In this course, special attention must be given to convincing the Freshman Engineer that his best means of achieving effective communication with the public, as well as his own colleagues, is by his *own* written and spoken word.

The instructor should be someone who is knowledgeable in the methods and judgements that must be used in creating a good piece of technical writing. The prime emphasis should be directed toward the task of getting the Freshman's ideas down in writing so they mean the same thing to the reader as they do to himself. To do this effectively, he must be shown how to translate the engineer's specialized jargon into simple understandable sentences. The instructor should show the students what to look for in a good technical article. This can be accomplished by reviewing, in class, a number of good and bad technical articles from well known technical journals and college engineering magazines. Furthermore, the instructor should go out of his way to encourage the students' attempts at writing. It is this lack of encouragement, by editors and supervisors, after the engineer graduates, that finally shoots-down the prospective engineer-writer. To add to their encouragement, the instructor can select the students' good attempts at writing and submit them to *Mecheleciv* magazine. I'll assure you that the editor would be most agreeable to consider them as articles for publication. This in itself would build an interest into students to write articles for *Mecheleciv* in the future. After all, *Mecheleciv* is the *students'* magazine and there cannot be a better proving-ground for the engineering students' writing ability.

It is about time the S.E.A.S. realized that it is doing the engineering students, as well as the school and the engineering profession a great disservice by not offering a course in Engineering Communications such as the one outlined in this editorial. It's about time for the S.E.A.S. to do something about it.

David R. Armstrong

LETTER TO THE EDITOR

Engineers' Council Reaction to Grades

The following letter and memorandum were sent to Dean Liebowitz and a copy to Mechelecіv at the request of the Engineers' Council.

Dear Dean Liebowitz:

The sudden change in the grading system of SEAS and the deplorable manner in which the student body was informed of this change became a topic of discussion at a meeting of the Engineers' Council on November 6th. This letter is to voice our dissatisfaction with the faculty in its handling of this matter. We criticize the faculty's lack of good judgement in declaring such a significant academic transformation without as much as having the courtesy to invoke student opinion, when it is the students who will feel the greatest effect from such a change. The policy of dealing with academic problems on a predominantly administrative basis tends to distort the issues by giving them an administrative rather than academic bias. When the faculty separates itself from the student body to formulate academic policy, they essentially become an administrative body. It immediately becomes questionable that action issuing from such a body will be sensitive to the needs of the academic community.

We are not, at this point, condemning the new grading system, but rather the method by which it was formulated and presented. A new grading system should be subjected to much debate, and should be established only when the academic community of both faculty and students are satisfied that the new system will be an improvement over the old. Therefore, we request that the Committee on Grades be reinstated and restructured to permit student participation and to allow this committee sufficient time to study the pros and cons of a new grading system and determine its most beneficial form.

Respectfully,
Robert S. Grant
President, Engineers' Council

* * *

November 10, 1969

Memorandum To: Faculty

With regard to academic structure review and reform and other matters undertaken by the faculty which concern the students of SEAS, the Engineers' Council feels that it is essential to have student representation at faculty meetings. Such representation will assure a greater degree of satisfaction by the entire academic community with the business emerging from these meetings. We therefore request that the faculty permit the addition of two student representatives to its meetings with full voting privileges.

We hope the faculty will take this opportunity to demonstrate their desire to deal fairly with the student body. We feel that the student representatives will prove valuable to both faculty and students through conscientious input and a strengthening of communications.

Respectfully,
Robert S. Grant
President, Engineers' Council

* * *

Credit Where Credit is Due

Dear Sir:

Becoming involved with SEAS is truly a curious commitment; but saying something about it proves to be even more germane! "A Subject" writes of kings and barons while an editorial speaks of matching the students which the administration admits, to the school's present and future potential. The time has come to carefully examine our situation.

Many changes have occurred within SEAS. There was a time in our history when we were concerned about the renewal of our accreditation. As a freshman I failed to understand the apathy and lack of spirit and initiative among the students. SEAS needed a boost and Dean Liebowitz brought it with him.

Consider the following facts about SEAS: Today, for the first time in the history of SEAS we have a four year accreditation with ECPD! There is an additional three quarters of a million dollars worth of new equipment in our laboratories. Better knowledge of SEAS has come about due to a vigorous public relations campaign. Our admissions situation has changed favorably under Mr. Scot Mannion and the new Earn and Learn Program. Mr. Hooper reports that our research grants total 1.28 million dollars and are expected to increase by an additional six hundred thousand. SEAS has expanded its space to 2424 Pennsylvania Avenue and Staughton Hall. Better channels of communication have been set up with other parts of the University to reflect the needs of the engineer on campus. Most outstanding, complementing our faculty with seventeen additional members, SEAS can boast of a distinguished faculty!

The increased spirit of the student is evidenced by his involvement in clubs, societies, fraternities, and the Engineers' Council. At one time the Engineers' Council found it difficult to have a quorum at its meetings and now can hardly find time to adjourn.

Let us be able to say what we mean about SEAS and give full credit where credit is due!

Respectfully
Donald E. Wallroth, President
Gamma Beta Chapter
Theta Tau Fraternity

* * *

Professionalism Needed

The G.W.U. S.E.A.S. has undergone many changes in the recent past. The most important of these changes, of course, are the curriculum revisions which are aimed at producing better qualified engineers. This is of obvious importance today, especially in such a highly competitive technical society as ours. But not-so-obvious (it seems) is the need for some sort of professionalism in the education of tomorrow's engineer. Much has been said about the humanities, technical electives, etc., but what about professionalism? Any practicing engineer can point out its importance in the development of a well-rounded engineer, but the normal undergraduate engineering student does not want to know or does not want to take the time to find out.

Believe it or not, there is a possibility for professional advancement here at S.E.A.S. The student chapters of the various professional engineering societies are right here under our noses. Most engineering students don't want to take the time, mainly because there are no grades or credit given (not as yet anyway). Some say that there is nothing interesting going on within these societies. These very students, by becoming active members and spending a couple hours each month to help plan chapter activities, would become interested instead of criticizing what a *few* others are trying to do. These societies are like any other professional organization; a few men can't be expected to do what twenty or thirty men could do together. Programs become more interesting in proportion to the number of students active in the organization. It is a shame indeed to see these opportunities disregarded by so many engineering students. These societies have the potentiality to add much to the engineering education, but student involvement is a must.

In the last few years there have been many opportunities for engineering students to take part in society activities, but there was little interest in proportion to the number of students in S.E.A.S. It seems that other non-professional activities are more important to some students. If this is the case, best of luck to those students who don't have the time for a little professionalism in their chosen fields. They'll probably need some luck somewhere along the line.

(signed) Concerned

LETTER TO THE EDITOR POLICY. The opinions set forth in the "Letter to the Editor" page of this magazine are not necessarily the opinions of the staff of *Mechelecіv* magazine. This page is set aside each issue for use by students, alumni, faculty, and staff of the School of Engineering and Applied Science. The staff will also accept letters from other sources if the letters concern the magazine or would be of interest to the students, alumni, faculty, and staff of the S.E.A.S. *Mechelecіv* reserves the right to edit any letter if lack of space deems it necessary. If, in the opinion of the Editorial Staff of *Mechelecіv*, a letter appears to be unprintable, the staff reserves the right to return the letter to the sender stating the staffs' reasons for withholding it from publication. All letters must be signed; however, pen names may be substituted if requested.

Campus News

by John Clay Davies III

GRADING SYSTEM CHANGE

Beginning this semester the grade of D, which was the lowest passing grade, has been eliminated from the grading system here at the S.E.A.S. The new grading system incorporates: A, excellent; B, good; C, passing; F, failure; and CR, credit. The scholarship requirements for graduation, through February 1971, will remain the same. That is, in order to graduate a student must have a quality point index of at least 2.0 in *all* work taken at this University and accepted in the S.E.A.S. However, effective June 1971 and thereafter, a student in order to graduate must have a Q.P.I. of at least 2.2 for those *technical* courses taken as specified in the 5th through 8th semester of his curriculum. This means that there will not be any cumulative Q.P.I. for the first two years. Before graduation, a Q.P.I. will be averaged for those technical subjects taken during the last two years. This Q.P.I. must be at least 2.2 before the student's application for graduation is granted.

Changes were also made effecting probation and suspension. A student who received two grades of F in one semester will be placed on probation. If a student earns a grade of C or better in all courses during the semester of probation, he is removed from probational status. If he receives one grade of F while on probation, the probationary period is extended for a semester. Upon being placed on probation, a student may elect to undertake the Engineering Student Probation Program of testing, counseling, and remedial work available at the Psychological Clinic. If such a program is undertaken, the student is continued on probation until his scholastic deficiency is removed but for no longer than four semesters. At the end of this period, each student's case is considered in line with the usual probation-suspension philosophy. If a student receives one or more grades of F in a second semester of probation he will be suspended, unless he is participating in the Engineering Student Probation Program.

To be included on the Dean's List the student must satisfy the following requirements:

1. The candidate must achieve at least as many semester hours in course work with the grade of A as with the grade of C, on a minimum of 13 semester hours in one semester.
2. No grade below C has been received during the qualifying period.
3. No disciplinary action has been taken in respect to the student.

EARN & LEARN

This Undergraduate Program is an organized plan which integrates formal study at the School of Engineering and Applied Science with practical experience at the Naval Ship Research and Development Laboratory, Annapolis, Maryland. During this 5-year program it is possible for the student to earn more than $10,000 on planned technical work assignments at the Naval Ship Research and Development Laboratory, obtain a Bachelor of Science degree in such areas as Civil, Electrical, or Mechanical Engineering, and be in a preferred position upon graduation to obtain a permanent Civil Service position with a grade and salary commensurate with the student's education and experience.

The employment is related to the field of study in which the student is engaged, and it is diversified in order to afford breadth of experience. The work experience increases in difficulty and responsibility, and in general parallels the student's progress through the academic phases of his education.

Tuition, textbooks, and fees (exclusive of room and board) up to 50 per cent may be granted on request. If tuition assistance is received, the Co-Op student must agree to serve as a Government civilian employee after graduation for a period equal to the period for which tuition is granted.

To participate in this cooperative program, the student must be academically acceptable to the University and must meet the requirements of the Civil Service Commission for employment at the Naval Ship Research and Development Laboratory.

CAMPUS NEWS

FATIGUE & STRUCTURAL RELIABILITY

The Institute for the Study of Fatigue and Structural Reliability is a major resource center at the School of Engineering and Applied Science. The Institute is under the technical direction of Dr. A.M. Freudenthal, an internationally recognized authority. The Institute, in addition to advancing interdisciplinary research, provides specialized training for graduating students in these fields.

The basic objective of the Institute is to develop an interdisciplinary approach to fatigue research on the basis of close cooperation between research workers in different fields working within the same group. The principal emphasis of the Institute is the study of the physical mechanism of damage initiation, with a view of establishing the principles for the rational design of metal alloys of superior fatigue performance on the one hand, and on the development of advanced methods of fatigue design and reliability analysis on the other. In view of the large volume, past and current, of straight fatigue testing of standard test specimens in industrial, government, and many university laboratories, no testing of this type is, in general, done by the Institute. However, results of such tests appearing in publications and reports are carefully scrutinized for their significance in terms of the purposes of the Institute. The Institute conducts seminars, issues technical reports, and supplies information, lectures, and consultations to many government and industrial research and development laboratories.

The Cambridge "stereoscan" scanning Electron Microscope.

A stressed specimen under the scope (2000 X).

The Institute has recently purchased a Cambridge Stereoscan Scanning Electron Microscope and installed it in the Institute's laboratory in Tompkins Hall.

The Scanning Electron Microscope (SEM) uses a fine beam of electrons to probe the surface of solid specimens. It enables the examination of surfaces whose roughness or other characteristics make their observation extremely difficult or impossible by means of a light microscope or a conventional transmission electron microscope.

The depth of focus is at least 300 times greater than that of a light microscope and the specimen does not require special sectioning or replication as in conventional electron microscopy.

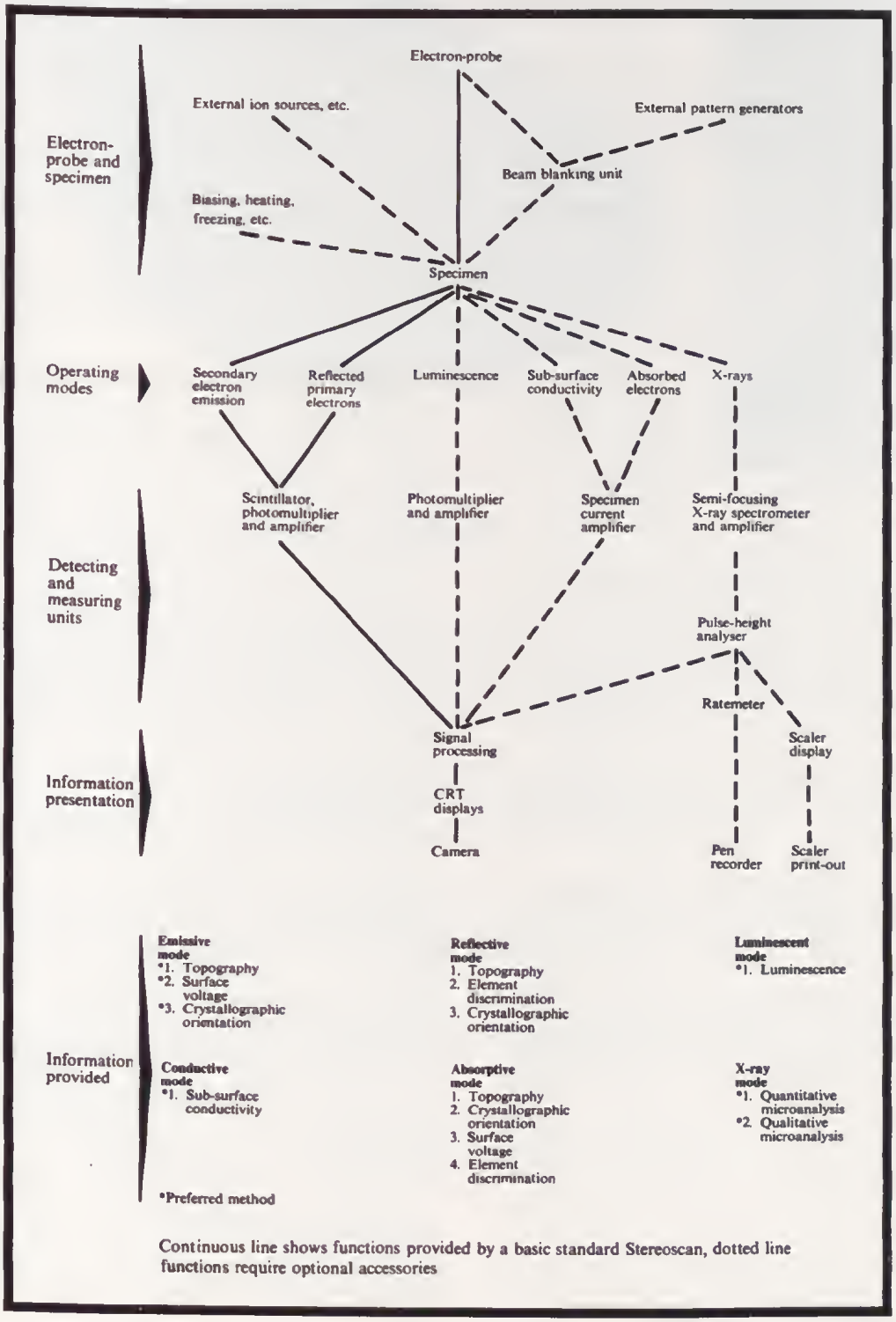
In addition to surface details, several other kinds of specimen information may be obtained with the SEM. These include superimposed voltage contrast, which reveals the location of electric fields in the sample, superimposed crystallographic orientation patterns, and basic element discrimination.

A specimen is easily prepared for examination by attaching it to a flat disk with conductive paste. If the specimen is nonconductive, a thin metal deposit is evaporated on the surface prior to examination. A specimen

containing moisture may have to be dried prior to the evaporation process.

INSTITUTE FOR MANAGEMENT SCIENCE

The Institute for Management Science and Engineering was created to define and develop new management techniques required to keep pace with our ever-expanding



technology. At the School of Engineering and Applied Science, the Institute will provide a multidisciplinary environment for innovative graduate teaching and increased opportunities for research activities and public service. Initially, about nine new faculty appointments and 13 teaching and research assistantships will be available in the Institute.

Management science and management engineering have for some time been emerging as new and exciting multidisciplinary endeavors. Traditional disciplines such as mathematics, economics, and statistics have figured prominently in these efforts as have newer fields such as operations research, systems analysis, system engineering, and the computer sciences. The broad scope of the involved discipline attests to the significance of management science and engineering for education, research, and public service.

In cooperation with the Program of Policy Studies in Science and Technology, the Institute has initiated a program, primarily with NASA support, which will place major emphasis upon the development of an analytical research capability in the following areas of inquiry:

organizational design for new technological program, ways in which new technologies can be applied to the solution of social problems;

the process of technological innovation;

the interrelationship of government-supported research and development and R&D activities in the private sector; and

methods of assessing the benefits and detriments resulting from technological applications; the assessment of existing and prospective technological applications and their technological, economic and social impacts.

This research will play an increasing important role in the expanding educational and public-service involvement of the School of Engineering and Applied Science.

Elements of the reorganized and restructed Logistics Research Project are being transferred to the Institute as the foundation of a new unclassified program in logistics. This will enable the Institute to perform research leading to the development of a science of logistics featuring principles and methodology for resource allocation problems in civil affairs and national defense efforts. The fundamental character of this type of research should make useful results available for the resolution of diverse problems arising in private and government contexts. The principal academic fields directly involved will be operations research and management science. Initial areas for major concentration of logistics research will be inventory systems performance measurements, dynamic scheduling systems for transportation planning, cost estimation for ship construction, and general problem solving computer programs.

The research guidelines for the Institute for Management Science and Engineering are wholly and specifically in accord with the new University policy on sponsored research. This policy recognizes obligations of citizenship and states willingness to engage in public service research whenever:

(a) there is a clearly demonstrated need;
(b) The University is the best fitted institution; and
(c) the research itself is compatible with the nature and purposes of the University.

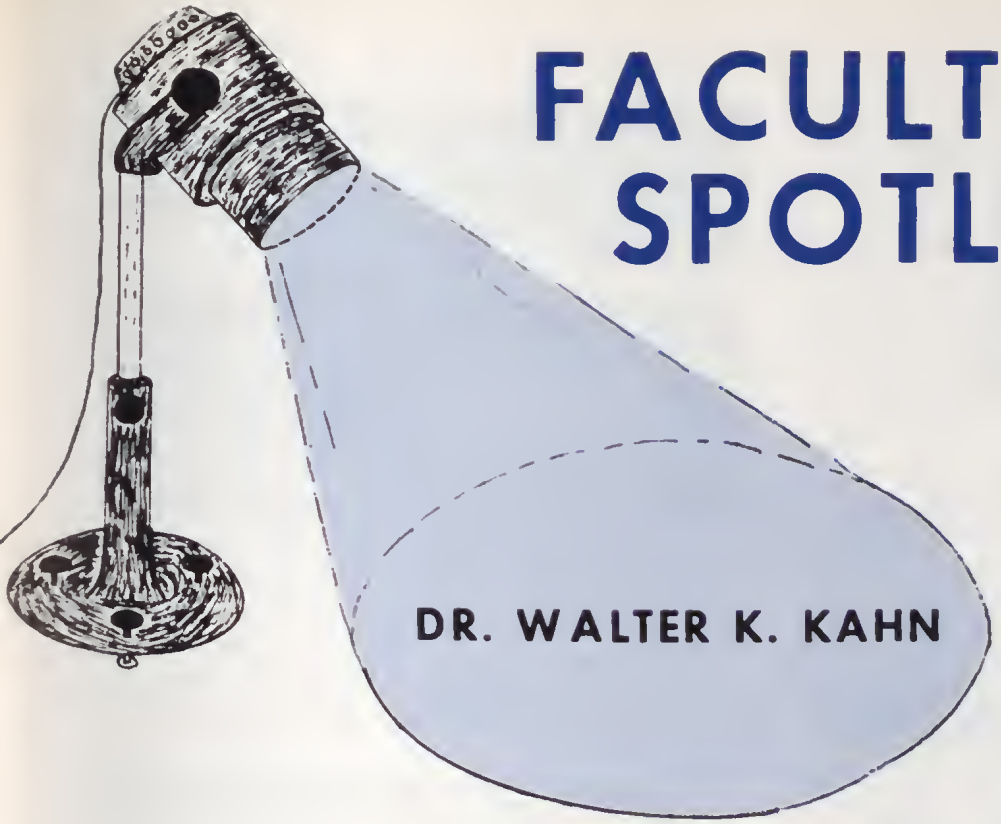
The programs of the Institute will be concerned with important educational and public-serviced needs for conservation of natural resources. The program will require full-time interaction between students, faculty and staff in ways possible only at universities. All these programs will follow the new policy guidelines to ensure that needs will be served both for the University and its external sponsors of research.

External support for the Institute will take the form of contracts, grants, and gifts. Major support will be provided under cost-reimbursable type contracts resulting from unsolicited proposals. These require that the Institute specify the exact form of the research it wishes to conduct. Once a contract has been made, expenditures are possible only under the authorization of the Principal Investigator on the basis of approved written proposals.

Initial support for the policy studies program will be provided by NASA, and the program in logistics and related areas will be funded by the Office of Naval Research. These efforts, as described above, will consist of publishable unclassified research which will have strong academic orientation and will be performed by an integral academic part of the University.

Dr. W.H. Marlow has been appointed as Professor in the Department of Engineering Administration and Director of the Institute for Management Science and Engineering. Participation by faculty members and graduate students from all schools in the university will be encouraged as consistent with the multidisciplinary objectives of the Institute. In the effective university tradition, such participation requires that the individual becomes involved by his own free choice. Participation by staff research specialists will also be required in order to achieve preeminence in research. Special provisions are being made for substantial contributions from "distinguished visitors" from other universities.

The Institute will disseminate its results through seminars, colloquia, and conferences. Special series of monographs are planned as part of the emphasis on open publication of results that will be available to any interested person.



FACULTY SPOTLIGHT

DR. WALTER K. KAHN

BY JOHN CLAY DAVIES III

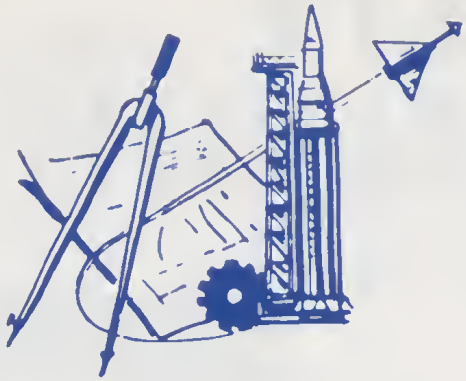
Dr. Walter K. Kahn has recently joined the SEAS Faculty in the Electrical Engineering Department. He received his BS degree from Cooper Union School of Engineering, and his MEE and DEE degrees from the Polytechnic Institute of Brooklyn. Dr. Kahn's chief interest lies in the topic of Fields and Waves. While at Brooklyn Poly, Dr. Kahn was Assistant to the Director of the Microwave Research Institute, and Professor of Electrophysics.

Dr. Kahn was a member of the Technical Staff, Bell Telephone Laboratories, 1963; Liaison Scientist, U.S. Office of Naval Research-London Branch, 1967-1968; Member of the Technical Staff, IBM Thomas J. Watson Research Center, Summer Months 1969.

Dr. Kahn is now teaching the graduate course in Microwave and Components (EE 233) and the graduate course in Antennas (EE 235). Next semester he hopes to teach the graduate course in Optical Electronics (EE 226) and the undergraduate course in Fields and Waves (EE 32).

Dr. Kahn is the author of about forty five papers and holds several patents on Waveguides and Microwave Devices. He is a fellow of the IEEE and is on the Standards Committee for Antennas and the Standards Committee for Waveguides. He is a member of Sigma Xi, Eta Kappa Nu, and the Optical Society of America.

We welcome Dr. Kahn to the School of Engineering and Applied Science and look forward to a mutually rewarding association.



Tech News

Edited by Gregory D. Smith, E.E., '72

Tug hauls Fabridome into middle of Santa Barbara Channel where it was submerged some 200 feet for installation. Units are placed over ocean floor leaks with centers suspended by buoys. Oil rises to top of "tents" where it flows into special underwater hose lines back to drilling tower. Oil's specific gravity and escaping natural gas propel oil in lines.

CALIFORNIA RESCUE MISSION

The story begins in the folds of geologic time. During a period of massive quaking and shifting, faults were created in the earth's crust near what is now Santa Barbara, California. A heavily fractured, unstable area resulted.

In the summer of 1968, Union Oil Company began to build an offshore drilling structure to be known as Platform A. The prospects for profitable oil production here were bright. Oil-rich sand lay untapped just nine feet below the sea floor.

During routine operations at Platform A last January, the drill pipe hit a high-pressure dome area. Blowout preventers immediately sealed the well. It seemed that trouble had been averted. However, fifteen minutes later – nearly a thousand feet from the sealed well – gas and oil began to rumble up through the water.

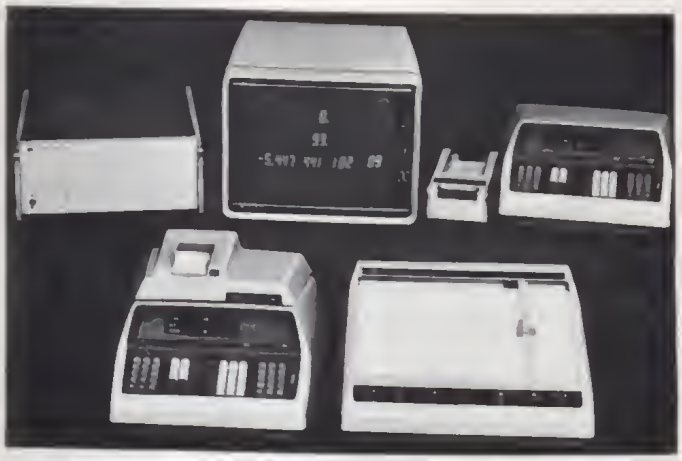
What happened during the days and weeks that followed is well known. Publicity was hot and nationwide. The ocean and the beaches and the wildlife were caked with layers of the thick sticky oil.

A proposal submitted by Richard T. Headrick, engineering consultant with Firestone Coated Fabrics Company, looked especially promising. Headrick's idea was to collect and control the seepage, not to stop it. Working with Firestone, he developed specially treated tent-like structures to straddle troublesome portions of the ocean floor. Experiments were carried out with small tents made of ordinary sailcloth. The success of these tests meant they were ready for the next step.

Late last spring, two of the structures – they were dubbed "Fabridomes" – were placed in the Santa Barbara Channel at a depth of over 200 feet. The larger of the two is 1200 square yards. The smaller Fabridome is 300 square yards. They are constructed of nylon, coated with polyvinyl chloride, and anchored at their edges by heavy, 20-inch steel pipe. Seacocks and air valves in the pipe permit submerging and surfacing for ease of relocation. Static buoys are employed to raise the centers of each Fabridome, creating the tent-like appearance.

As the oil seeps from the fractured sea bottom, it rises – due to the pressure of the accompanying natural gas and water's greater specific gravity – to the tops of the Fabridomes. That's where Hewitt-Robins comes in. As the oil reaches the tops of the Fabridomes, it rushes into a transfer complex of 2-, 3-, and 4-inch Hewitt marine hose. Each specially compounded and wire-reinforced conduit system contains hose sections connected by epoxy-coated steel menders, stainless steel bands, and Kamlock fittings. Thousands of feet of hose are currently draining the two original Fabridomes and the three which since have been erected in the area.

The bleak winter spectacle is over for Santa Barbara. The Fabridomes are keeping their promise. The sea and the land here can look forward to a better day.



HP Calculator System 9100 includes (top, left to right) the extended memory module, the large screen display, marked card reader and the Model 9100A Calculator. In the bottom row is the 9100B Calculator with printer and X-Y plotter. Not shown is the coupler module.

A NEW 'PERSONAL' COMPUTING SYSTEM

A new Hewlett-Packard computing calculator system, offering a choice of two desktop calculators, includes a variety of peripheral accessories and a program library. This versatile system is relatively inexpensive, does not require special computer training to use, yet it outperforms some computers.

All the elements in this new HP Calculator System 9100 are compatible. The user may choose the HP Model 9100A Calculator, capable of solving a large number of his routine engineering and scientific problems, or he can choose the more sophisticated Model 9100B which has double the memory plus subroutine capability to handle more complex problems. The peripherals work with either calculator without modification. They simply plug in.

More accessories, just as compatible, are in the future, to guard the system against obsolescence. For additional memory, to provide additional data storage and program steps, an extended memory package will be available. It will plug into either calculator, adding about 250 registers to provide about 3500 more program steps.

Another accessory to add versatility to the system is a coupler with which the calculator will accept a variety of inputs, and provide output in a number of formats. With the coupler, input to the calculator can be from punched tape, a teletypewriter keyboard, or in real time in BCD form directly from instruments. The system will perform the calculation, display output on the CRT, plot a curve, print a formatted page on a teletypewriter, or punch a tape.

A large-screen display – a 17 inch diagonal CRT – can be plugged into the system. This relatively inexpensive display will be used in classrooms or for display to any large group.

One of the most valuable parts of the system is a large program library. Programs of many categories include mathematics, statistics, electronics, mechanics, business, physics, thermodynamics, surveying, structures, fluid mechanics, life sciences, chemistry and secondary education. About two-thirds of the programs can be run on either calculator, one-third require the additional capability of the Model 9100B.

Program steps can be entered into the calculators manually, then recorded on a magnetic card. Programs recorded on the magnetic card are entered back into the machine as easily as dropping an envelope into a mail slot.

A second computing calculator is now part of the growing HP family of calculating devices. The new HP Model 9100B resembles the successful Model 9100A in its external appearance only. New features increase efficiency and give it increased computational ability to solve problems more complex than can be handled by the Model 9100A.

Both Models 9100A and 9100B perform calculations ranging from simple addition and subtraction to highly sophisticated scientific computations. Both calculators handle a wide range of numbers at one time (from 1×10^{-98} to $9.999\,999\,999 \times 10^{99}$).

Subroutine techniques are valuable where conversions are wanted, such as degrees, minutes, seconds to decimal degrees, or a conversion from Centigrade to Fahrenheit. X-Y plotter scaling can also be handled as a subroutine.

The Model 9100B has subroutine capability. A subroutine is a sequence of program steps used many times, but stored only once in the memory. A program may 'call for' (i.e. branch to) the subroutine at any point designated in the program. When the subroutine is completed, the program automatically returns to the program step following the program step from which the subroutine was called. By storing a repetitive subroutine in the memory just once, the operator is able to save valuable program memory space.

In the Model 9100B, up to five subroutines may be 'nested.' The calculator 'remembers' up to five return addresses at one time. As soon as a return is made from a subroutine, the return address of that subroutine is forgotten and the calculator is ready to remember another return address.

Despite their ability to perform complex operations, the calculators are simple to operate. Their log, trig and mathematical functions are each performed with a single key stroke. Computerlike memory enables the calculators to store instructions and constants for repetitive or iterative problem solutions. An easy-to-read cathode ray tube instantly displays entries, answers and intermediate results.

Focus on the Student Magazine

By Burton J. Gleason

This article and the one after it have been reprinted by permission in the hope that the readers of Mecheleciv *might gain some insight into the reasons for having a student publication. Furthermore, we hope these articles might encourage some of our readers to join the staff and help make* Mecheleciv *a better magazine.*

More than 80 accredited colleges of engineering support an engineering student magazine on their campuses. This means that at least 42% of the accredited schools of engineering in the United States recognize the need for and value of such a magazine.

STUDENT MAGAZINE ADVISERS COMMITTEE

The engineering student magazine is receiving increased attention because of the many opportunities it offers as an extracurricular activity. Within ASEE the Engineering Student Magazine Advisers Committee (ESMAC) offers assistance to engineering student magazine advisers and staffs. ESMAC has prepared an engineering student magazine manual, publishes an engineering student magazine advisers newsletter, and conducts an apprenticeship program with the industrial press. Various programs and seminars are held in conjunction with ASEE meetings. A survey of all engineering college magazine business and editorial programs has been published. ASEE now has an annual award of $1000–the George O. Hays Award sponsored by Penton Publishing Company–which is presented to the engineering student magazine adviser who has contributed most of the advancement of the engineering student magazines (see p. 47).

At the June 1969 ASEE Annual Meeting at The Pennsylvania State University, ESMAC presented a conference on business and editorial matters for engineering student magazine advisers and sponsored a panel discussion by four deans of engineering on "Why I Support the Engineering Student Magazine." Chairman of this panel was Harold A. Bolz, dean of engineering at The Ohio State University and a member of ESMAC. Other panelists were: George R. Town, dean of engineering at Iowa State University; George E. Dieter, dean of engineering at Drexel Institute of Technology; and Fred J. Benson, dean of engineering at Texas A&M University.

EDUCATIONAL VALUES

The discussion was opened by Dean Town, who explained the educational values of the engineering student magazine. He called it a laboratory in written communications for the engineering student, and an important medium of communication between faculty and students as well as among the students themselves at a time when lack of communication between faculty and students is a criticism of our universities.

Dean Town also pointed out that although there have been periods in recent history where interest in student extracurricular activities has diminished, especially during periods of armed conflict, the engineering student magazine at Iowa State–the *Iowa Engineer*–has always run counter to any diminishing trend. One reason is that the magazine provides a very tangible service to the college through both communication and education. A tremendous asset for any college of engineering is student enthusiasm and esprit de corps; however, the value of an engineering student magazine in these areas is not often realized nor recognized adequately.

He stressed three points of view in evaluating engineering student magazines–that of the students, that of the college,

Reprinted from "Engineering Education," September 1969;

and that of the dean.

From the student's point of view, the magazine gives him a unique opportunity to develop his writing and communication abilities, an opportunity not normally available elsewhere in the engineering program. It also provides business experience for the student, as he develops the budget and drives various sources of income. Another very important aspect in the development of the student is establishing the habit of meeting deadlines–something that an engineer will be doing his entire professional life.

The student also has the opportunity to develop valuable leadership qualities. He can become a spokesman through the editorial page. Through organizing and directing his staff, he gains valuable management experience. As President M.A. Williamson said at the ASEE business meeting, "This will be the year of the student," and we have here one major means of communication with and for the student.

From the point of view of the college of engineering, student magazines provide a window for the college and university, through which the outsider–including high school students–can better see the workings within.

From the point of view of the deans, the magazine provides the vehicle to communicate with the students through a regular column or dean's page. It provides a channel of communication for discussing professionalism, curricula, value of extracurricular activities, postgraduate experience, and the meaning of the university to the student. A very important benefit for both the college and the students is the opportunity for communication and feedback. A sounding board, a channel of communication is established and available.

Problems involved in sponsoring an engineering student magazine include identification of the fine distinction between faculty guidance and censorship. If any one item caused deans more concern than others it would probably be the joke page. The second area of difficulty often experienced is that of financial support for the magazine.

BENEFITS GREATER THAN PROBLEMS

Dean Dieter stated that it is up to the faculty to point out to students the opportunities available to them on the engineering student magazine staff. Often there is lack of faculty encouragement, because many faculty members are unaware of the total program of the student magazine.

Not only are there many benefits available to the student who participates in this activity but there is also an opportunity to provide insight into new fields, thus spreading student horizons. Fringe benefits for the college include another opportunity for contact with alumni, parents, and high school students.

At many schools, special issues of the engineering student magazine emphasize areas of engineering endeavor. An expanding area of interest is that of the relation of current social problems to engineers.

Because the engineering student magazines at the various universities exchange copies, they are able to see what is going on at other schools and to compare progress at their institution with other leading colleges. The magazine provides an additional benefit to engineering colleges with cooperative programs by keeping off-campus students informed about on-campus programs.

Dean Dieter also noted the many opportunities for careers in technical publishing for engineers and the value of the preparation provided for these careers by engineering student magazines. Technical publications provide a medium of "continuing adult education" and serve hundreds of thousands of professional people who rely on the business press for their continuing education. A survey answered by 67 American Business Press member magazines revealed that 246 of their editors hold degrees in engineering, or an average of four per publication. One of these magazines has 16 engineers on its staff.

EMPHASIS ON THE STUDENT

Dean Benson felt that the engineering student magazine had contributed much to the esprit de corps at Texas A&M. He added that the staff benefited greatly from their participation and that the only area of concern to him has been the joke page, which occasionally caused unsolicited critical letters from nonstudents. In order to provide a better understanding of the total college program, the *Texas A&M Engineer* features in every issue a selected department or campus activity.

Dean Bolz observed in his summarization of the discussion that the staff, among all its other benefits, learns that there is a difference between giving orders and getting the job done; there are the people problems to be solved. He also pointed out that it would be well for the college and university administration to remember that the engineering student magazines are *by and for the students.*

Continued on page 32

Burton J. Gleason, administrative assistant to the dean of engineering at Iowa State University, serves as adviser to the "Iowa Engineer." He is immediate past chairman of ASEE's Engineering Student Magazine Advisers Committee. Current ESMAC chairman is Walter L. Rosinski, Marketing and Public Relations, General Electric Company, New York City.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WHY

Student Engineering Magazines?

By Paul T. Bryant, **Department of English, Colorado State University**

WHY SHOULD THERE BE student engineering magazines? Are they worth the cost in time and money?

Probably not now, but they could be. A student engineering magazine could add significantly to the educational experience of every student in engineering and become a major new dimension to the education of students serving on its staff. It could be the most important student activity in the college. To realize this potential, most of these magazines need a new approach and a clearly conceived reason for being.

In the February 1966 issue of *Engineering Education* (page 211), Warren W. Wood presented the generally accepted values of this student activity:

> The most conspicuous benefits of magazine publication stem directly from the staff work itself. Management-oriented engineering students find here a unique opportunity to learn and practice operational techniques and to observe immediately the results of their actions and decisions. The important skills of staff selection, direction, evaluation, and promotion are learned and practiced in the touchy environment of an effort where cooperation is voluntary. . . .

Professor Wood says further that such experience adds to the graduate's marketability, the magazine serves as a public relations medium for the college, and, finally, it provides a forum for student criticism of the college.

This indicates some of the potential of the student magazine, but few faculty advisors would maintain that they are realizing that potential. Many of these magazines are little read by the students, have inadequate staff, cannot keep the same staff members long enough to build up experience, and are hard pressed to obtain enough publishable material. This is true because few can answer adequately the questions at the beginning of this article.

MEETING THE COMPETITION

No member of an engineering faculty needs to be told about the heavy demands on his reading time. The same is true for engineering students. In such competition for reading time, *a magazine must find what it can do better than any other publication,* and then capitalize on that strength. Second best will not get readers. Without readers, a student magazine becomes just an academic exercise.

What, then, can a student magazine do better than anyone else? To answer that question, let us eliminate some things that the magazine cannot do.

The student engineering magazine cannot be a first rate *Popular Mechanics.* There are many professionally produced magazines on sports cars, high fidelity, amateur radio, and dozens of other hobbies. The student who wants information on these will go to the professionals and ignore the student magazine. The "gadgety" freshman research paper designed to overwhelm the poor English teacher who doesn't know a camshaft from a connecting rod will neither impress nor inform the average engineering student, and the high school student finding this type of article in the student engineering magazine will get a misleading conception of engineering.

The student magazine cannot be a first rate technical journal. The student who wants authoritative information on solid state electronics will go to professional journals in physics and electrical engineering, and not to a magazine produced by fellow students. He will not take a term paper

Reprinted from "Engineering Education," October 1967;

from a junior in electrical engineering as the last, best word on the subject, and so he will not read it.

Public relations material, sent by most large companies to student editors, will not snare any of the student's reading time, either. Again, the commercially published technical magazines keep up with what is really new in industry, without the public relations slant.

The student magazine cannot make too many concessions to the dean's desire to use it as a "house organ" aimed at high school students—a use that might interfere with lively and candid discussion of the college's problems. If the dean wants a recruiting magazine, let him publish one instead of diverting student efforts and trying to control what they write.

Finally, the student engineering magazine cannot successfully be either a joke book or a "girlie" magazine. If student readers look only at the joke page, the magazine is not accomplishing much, and the student editor who thinks he can win readers away from *Playboy* with pictures of a coed in shorts has lost all touch with reality.

These particular "cannots" are mentioned because these are roads student editors commonly follow to fill their pages and to get readers. They are taking on competition they cannot possibly beat. They should not even try.

THE BEST APPROACH

What the student engineering magazine *can* do better than any other publication is to represent its own school, talk about its own people, and focus on material that will be read. That approach can provide engineering students with experience preparing them for their careers, because it represents a realistic attempt at a genuinely effective publication. It requires students to be aware of the people and events around them, to use imagination and initiative. The local approach gives the student genuine experience in dealing with people, forcing him to learn what his readers like, are interested in, care about.

Let us consider some possible sources for material. First, a student magazine should carry news and features about its own engineering school. No other publication can or will want to do that job as well. This material should be selected on the basis of what students really want to know about. Several categories might serve as examples.

For example, students like to know about new courses, curriculum changes, and new majors. Suppose a new course will be offered the next term in network analysis. This is not a matter of campus-wide interest, and the student newspaper would not do anything with it. But to engineering students, this might be a matter of great importance. A reporter from the magazine staff might interview the professor offering the course, find out what the course will cover, what the prerequisites are, which students should take the course and why. This would help students know whether to take the course, and help the professor make students aware that the course is available. The same idea applies to new curricula.

The student magazine provides an ideal medium for the dean and department chairmen to inform students of the reasons behind policies and rules. Too often, colleges tell students how things have to be, but they do not tell them why. The best students, the ones who think for themselves, the ones who will make the best engineers, will question these rules and policies and perhaps resent them. They deserve an explanation, and the student magazine can give it to them.[1]

By the same token, when such students do have a gripe, the student magazine should provide a medium for airing it. Few students will go to the dean's office with a gripe, but many will write a letter to the editor, if they know it will be read by the right people. Most faculty and administrators like this type of feedback. A frequent complaint by students today is the lack of communication with faculty and administrators. The student magazine can provide that communication.

As a practical matter, the editor may have to start by urging students to write letters and articles making comments and raising problems, but once the magazine is recognized as a vehicle for such comment, students will use it. An important follow-up for the editor is to invite replies in the next issue, explaining why the situation exists and what is being done to correct it or simply taking issue with the complaint. In any case, student understanding should be improved. Properly done, this kind of interchange can lead to a healthy feeling of community of interest between students and faculty.

SOURCES OF MATERIAL

Organized student activities provide a rich source of material for the student magazine. Coming events can be announced, and past events can be reported. Students are made aware of activities they might participate in, and sometimes the publicity will encourage organizations to undertake more meaningful activities. Local activities of interest to engineers can be discussed even if they are off-campus.

Any student accomplishment or activity is good material for the magazine. People like to read about themselves and their friends. The old journalistic axiom, "names make news," is still true and should be recognized. The magazine

[1] This material should *not* be presented in that dullest of all institution's, "The Dean's Page." A member of the magazine staff should get the story—when there is one—through interviews with the dean and with anyone else is concerned. A standard institutional heading—"The Dean Speaks"—is an open invitation to the reader to skip that article. Every title should be related to the specific content of its article.

staff should find interesting items about people in the college and the community and talk about them.

Most engineering colleges have substantial research programs that can provide good material for the magazine, but there are dangers to be avoided. First, the student editor must resist the temptation to turn a report on local research into a technical paper. The good technical papers are obviously going to be published elsewhere. Instead, he should concentrate on the human angle—who the people are, what they are hoping to accomplish, how they are going about it, and so on. The best approach is from the student's viewpoint. Are students participating in any way in the project? If they are, talk about that. Do any of the faculty on the project teach courses on this subject and bring their research results directly to their teaching? Tell how and in what courses. In other words, the article should explore what the project means to the college, its faculty, and its students, and not just what it might mean to its sponsor or to the state of the art.

Articles about careers in engineering, and professional opportunities students can look forward to, can sometimes be interesting and useful to students. One article a year on job interviewing is probably worth some magazine space, too.

In all of this, the magazine should try to avoid the stuffy dullness of most professional journals. Term papers and laboratory reports will give the student plenty of practice in that type of writing. The magazine should encourage its staff to develop a lively, interesting style, and to include humor on occasion. Some engineers feel that light, interesting, witty writing is somehow undignified and hence unacceptable, but writing of this kind can indicate a balanced, intelligent viewpoint. Engineering is a mature, established profession that does not need to hide behind stuffiness in the name of dignity. An occasional light touch is much more likely to be read.

A resourceful student magazine staff will think of other possibilities. The basic rule is to use the local, personal approach, always looking for the local angle, the local people, the local interests, relating everything to the students and the faculty. This is the student magazine's strong suit—the one thing it can do better than anyone else.

THE BUSINESS SIDE

The local angle should be used on the business side, too. Most student engineering magazines have the aid of a large advertising agency. National advertising is contracted for, scheduled, and billed for by the agency, leaving the staff of the magazine with little responsibility. National advertising is valuable and helps pay the printer, but it gives the students little of the practical experience that is a chief benefit of student magazines. It may make the students think the selling of advertising is easy; it may make them lazy. All they have to do is take the plates to the printer, send tearsheets, and deposit the checks.

The local approach should be emphasized in advertising. Once a student magazine starts publishing material of interest to the students, it will be read by the students. When this happens, local businesses—book stores, record shops, all those catering to students, as well as local and regional companies who hire engineers but who do not advertise nationally—can be persuaded to buy advertising. Students who go out to them and do a good job of selling will come back with a substantial amount of local advertising. They have to have something to sell—a magazine that is really read—but given that and a little effort, they can succeed on the magazine's merits, not on the basis of a charitable donation to support a student activity. This is real experience with the hard facts of business life. To do this job properly, the magazine should have a well organized business staff.

ASSISTANCE TO THE MAGAZINE

Making a student engineering magazine a vital part of the college's life is not an easy, overnight job. It will take time and a fair number of disappointments, especially if the magazine has a history of ineffectiveness. A poor magazine has built itself into a vicious circle of frustration—low student interest means not enough staff to run the magazine; inadequate staff means not enough help to write and edit a good magazine that really covers the college; a magazine that does not cover the college but resorts to industry fillers and dull term papers will not be read, which means low student interest, which means inadequate staff, and the circle begins again.

Only strong and intelligent assistance from faculty and administration can break this circle. First, faculty and administration should make it clear that they consider the magazine important and that staff membership is a real distinction. Ways of doing this are plentiful and can be adapted to the local situation. Second, faculty who know how to produce an effective magazine should be asked to guide the students. If work on the magazine is to be meaningful experience, the student will benefit more from skilled professional guidance than from being left in the name of "student freedom" to muddle along in his ignorance. The engineers might even seek the assistance of faculty in journalism and English. Some of those people have useful knowledge in this field. A surprising number have degrees in science or engineering.

In providing assistance, faculty must be careful to avoid dominating the magazine. If students feel that they are cheap labor for the college's "house organ," the whole effort will fail. They should be given good professional

advice and constructive criticism; "trial and error" is too slow a learning process.

Finally, results should not be expected too soon. A full four-year cycle of students will be necessary before all student memory of the old, dull magazine is erased. In the meantime, significant progress toward the stated goals should be enough to justify continued support. Such progress *can* be made, and actually has been made at more than one university.

THE ULTIMATE BENEFIT

Professor Wood has already well summarized many benefits of a student engineering magazine: experience in management and writing; public relations for the college; a medium for criticism of the college by the students. Some others have been mentioned: information about new courses, curricula, policies; dialogue among students, faculty, and administrators; a medium to publicize and stimulate student activities; a way to give students and faculty a sense of community of interests and a feeling of *esprit* within the college.

All of these are valid, important, and sufficient to justify a magazine's existence, but there is an ultimate benefit greater than any of these. A student engineering magazine genuinely trying to speak to a real readership within its college, that clearly has a reason for being and a function it is trying to carry out, provides its staff with a kind of experience all too often missing from a technological education: *the requirement that a product function effectively for a given public.*

A student magazine trying to serve the students must gain acceptance under conditions of severe competition for the students' reading time. Regardless of the largesse of the dean's office and the income from national advertising, a student magazine that is not read by the students is a failure, and the staff of the magazine should be made to feel this. This necessity for effectively reaching and serving a specific public is a "real life" situation that must be met in one form or another by the practicing engineer. This kind of challenge, usually missing from other aspects of a student's preparation for engineering, will finally be the test of his work.

The time is long overdue for engineering colleges to take a cold, realistic look at their student magazines. Far too many are little more than ghosts, limping along with one or two faithful students doing all the work, and with no one reading them at all. With a careful formulation of objectives, with a little "know-how" from a few faculty, with the right encouragement and guidance, the student engineering magazine can become a central, important part of the life of an engineering college. It can be a significant activity commanding student respect and interest, providing useful experience, and helping both the college and the students. It can become the "voice" of the college, the forum for news, information, opinion, the pivot around which the life of the college turns—the one publication students and faculty cannot afford to miss. The time has come for student engineering magazines to start living up to their real potential.

* * * * * * * * * *

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Here is your chance to show off your creative genius. Here is a chance to receive that long awaited recognition. There is probably some area of engineering which your work emphasizes or some subject which is of special interest to you. How about sitting down and writing an article on this subject. Then support *your* magazine by submitting it to *Mecheleciv* Don't turn the page . . . . that article could put money into your pocket!

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SOLID-STATE DISPLAYS

RIVAL THE CATHODE RAY

Since it was invented, the cathode ray tube has been virtually unrivaled as a general-purpose display device. It is a flexible and relatively inexpensive device that is particularly well suited for displaying images where gray scaling is important. But the CRT, as well as other display devices such as the gas-discharge tube, electromechanical meters, and even the light bulb, are not without disadvantages, and these disadvantages are becoming less tolerable as solid-state technology sweeps through electronics. The CRT is large in volume and needs high operating voltages. A vacuum is needed, and it imposes a limit on the maximum size of the display surface. The cathode ray tube phosphor has a very short memory, which is good for some applications, but not so for others. Some storage scopes have longer memory, but the penalty is reduced resolution and contrast.

Work has been going on in the area of solid-state displays for a number of years (notably, at General Electric) and many contributions have been made to their development. Today there are three techniques that are receiving considerable attention: they are magneto-optics, electroluminescence, and light-emitting semiconductor devices. Electroluminescent technology has already been applied to some products and is ready for use in others. Magneto-optics and light emitting devices have reached a point where they too are ready for certain applications.

Generally, these solid-state display techniques share the following advantages:

- Flexibility: many shapes, sizes, and arrangements of elements are possible.
- Flat: they occupy little volume and are easy to design into a system.
- Compatible with Microelectronics: requires low voltage.
- High Speed: Compatible with computer rates.
- Inherent Memory: generally, once information is written on them, there is no need to re-write until the information changes.
- Long Life/High Reliability: like all other solid-state devices.
- Larger Display Area: there is no theoretical limit on the size of the display.
- No Vacuum: as needed by CRT's and gas-discharge tubes.

In addition, individual display techniques offer special advantages.

ELECTROLUMINESCENT DISPLAYS

Electroluminescence is the emission of light from a phosphor when an electric field is applied. EL cells appear to emit continuous light, but actually they flicker at a rate twice that of the frequency of the applied electric field. The first sustained emission of light was achieved in 1936.

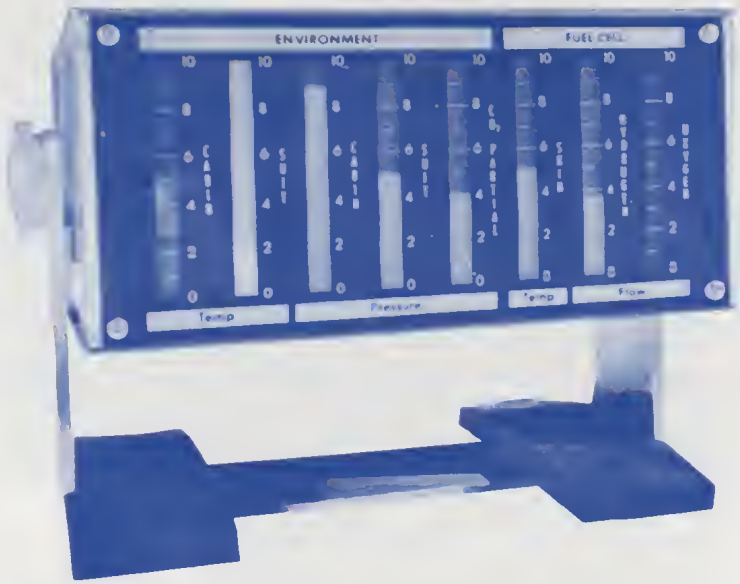
Modern EL cells are phosphors sandwiched between two electrodes and encapsulated in plastic or glass. One of the electrodes must be translucent to allow the light to pass and the other is generally aluminum to reflect light and thereby increase the brightness. However, it is possible to make both electrodes translucent in order to devise a two-sided display.

EL cells have a number of advantages important to solid-state displays including a wide choice of colors, good brightness under high ambient light conditions by using contrast filters, and choice in the physical dimensions of individual cells. This latter feature permits the use of electroluminescence in both small and large area displays.

General Electric has developed electroluminescence for a number of applications, including meter displays. The bar graph display pictured demonstrates the excellent manner in which EL cells can display many different conditions in an integrated fashion. By adjusting the cells to read at mid-scale under normal conditions, an observer can tell at a

By Sidney J. Harmon

TUBE



glance when a reading is above or below acceptable limits.

Electroluminescent materials may be combined with photosensitive materials in order to convert energy from the infrared to the visible part of the spectrum and at the same time amplify the light. Thus, the output of an array of infrared light-emitting diodes can be converted to a visible display and amplified by a factor of from 10 to 100 by an EL image converter. Without the EL panel, from 10 to 100 times the power output is required from visible light-emitting diodes to achieve the same brightness. Also, because of the variety of colors available in EL, the output of the display can be any desired color.

EL cells do degrade in time; however, it is a very slow deterioration and catastrophic failures seldom occur. Offsetting the finite life cycle of the cells are their very low cost and easy replacement. A cell for the bar-graph display previously referred to simply plugs into a printed circuit connector.

Of the three solid-state display techniques, electroluminescence is the most highly developed and considerable hardware has been built and has served reliably. Solid-state switching methods that are compatible with microelectric circuit signal levels have also been developed.

MAGNETO-OPTIC DISPLAYS

Unlike most other display techniques, a magneto-optic display does not emit light. Instead, the image is formed by diffracting an external light source being shone upon the display. The brighter the light source, the brighter the display.

The MO display contains a thin magnetic film having a

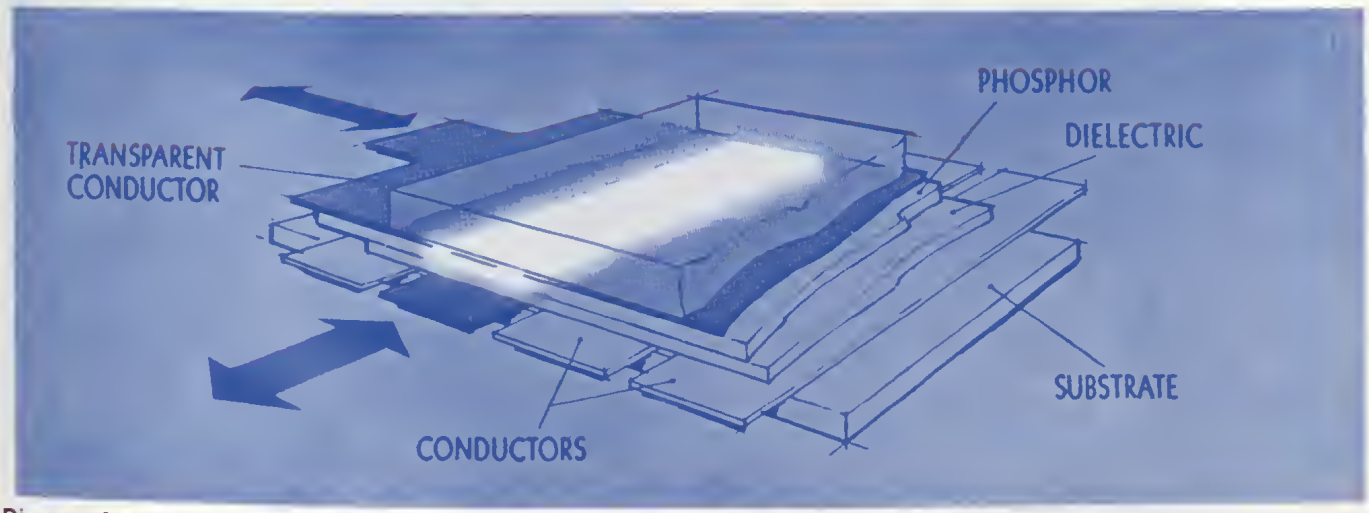


Diagram of an electroluminescent cell.

—Courtesy General Electric

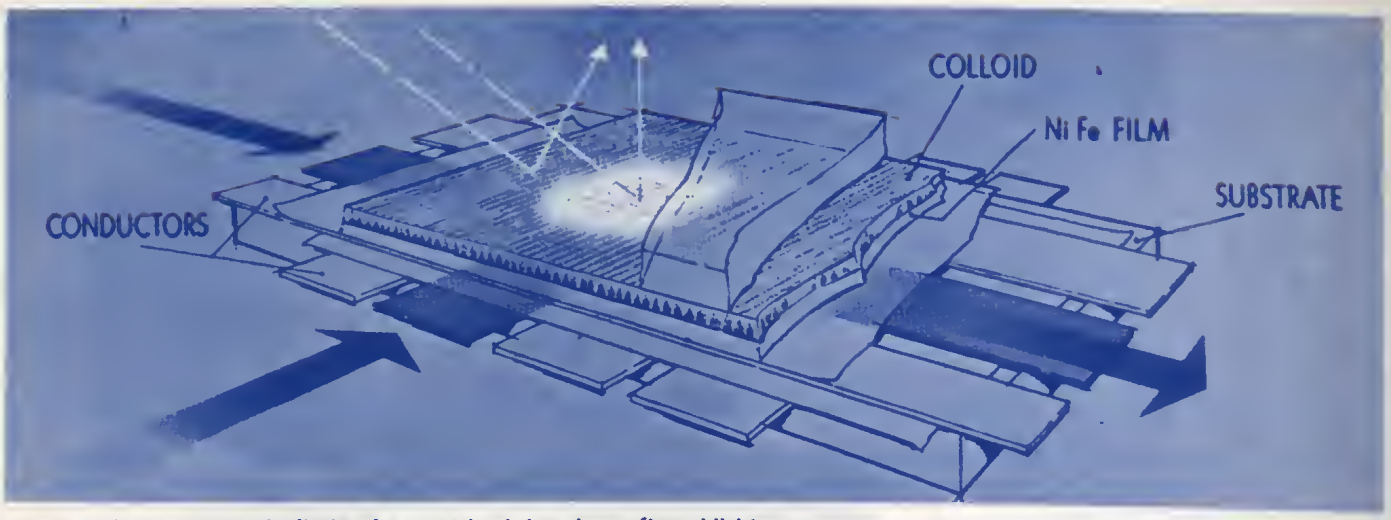


Diagram of a magneto-optic display. Its operation is based on reflected light.

—Courtesy General Electric

domain structure of long stripes that are separated by a distance of about the wavelength of light. On top of this magnetic film is a colloidal suspension of ferromagnetic particles (Bitter's solution) that conglomerates at the domain boundaries in the magnetic film to form a diffraction grating. Finally, a matrix of row and column electrical conductors is added behind the magnetic film and the structure is sealed between two glass plates. When a current is put through a row and column conductor, the grating reorients 90 degrees in the vicinity of the intersection of the two conductors. By correctly addressing the conductors in the matrix, elements (intersections) are turned "on" or left "off" to form an image. It is also possible to write on the display with a magnetic pen or any other means of forming a local magnetic field.

There is no physical restriction on the maximum size of an MO display, and the need for an external source of light reflecting off the surface may be replaced by edge-lighting the structure. MO displays have a long-term stable memory that is unaffected by power failures; the only way to alter the information written on them is to introduce a magnetic field of sufficient magnitude.

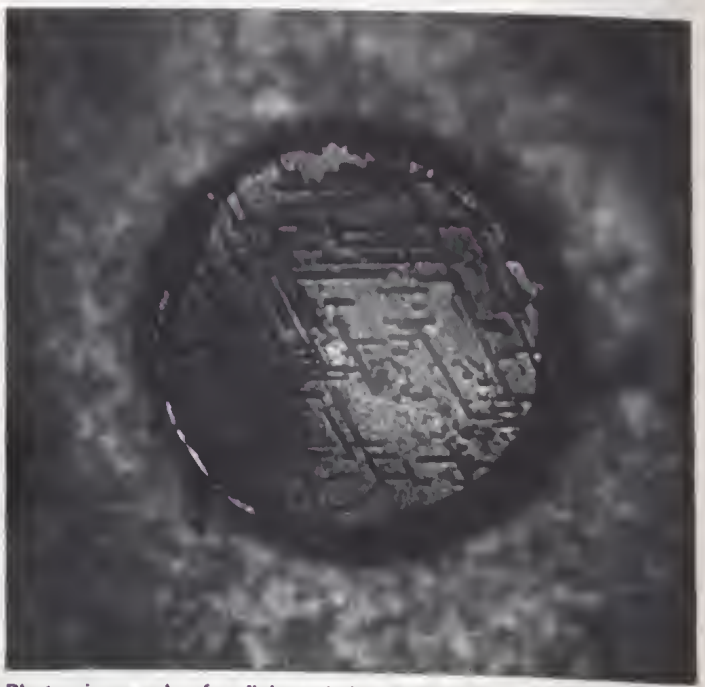
An interesting feature of MO displays is in contact printing of magnetic tape. If a computer tape is brought in contact with the display surface, the particles in the display are activated and a visual record is produced. This process is instantaneous and no chemical or other processing is required.

Presently, the MO display seems to have the best potential of all the solid-state display techniques for: radar displays, cockpit fire-control displays, large-screen data displays. Because it can be addressed either electronically or manually with a magnetic pen, it would be a very useful input/output unit for a computer. The computer would write on it electronically, while the operator could write instructions to the computer with the pen.

Magneto-optics has received considerable research and development under several government contracts. Working models have been built that demonstrate feasibility and usefulness for specific applications.

LIGHT-EMITTING SWITCHES

There are a number of companies working today to produce displays composed of thousands of light-emitting diodes. These tiny devices emit light, either visible or infrared, when a certain voltage is applied. Individual elements in the display are lighted by addressing each spot or by scanning X-Y matrix of interconnections. Light-emit-

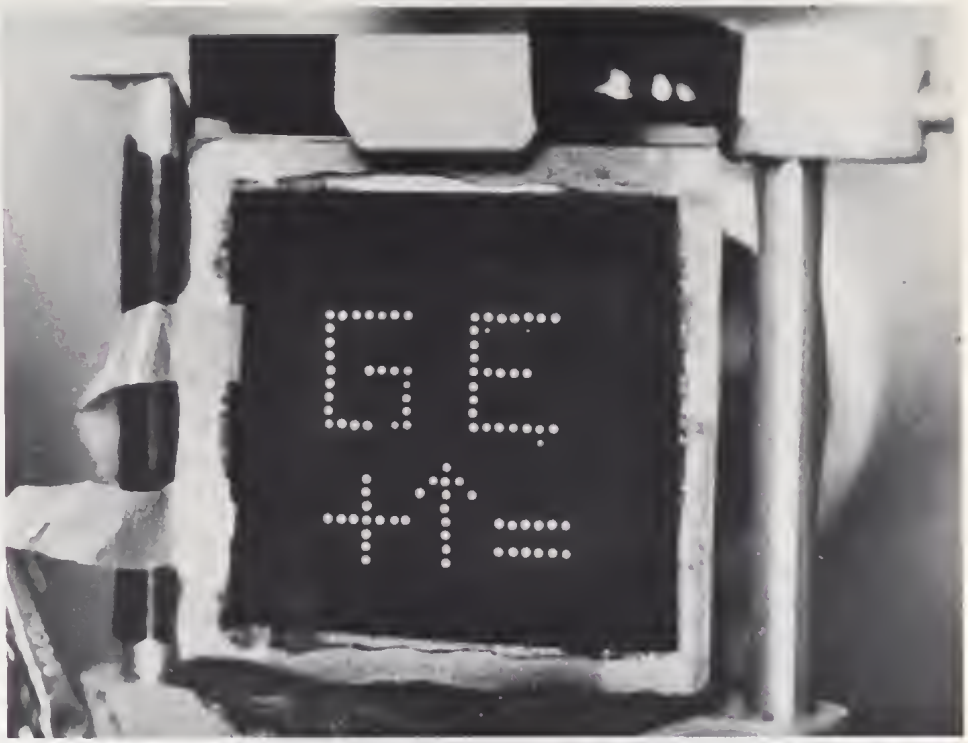


Photomicrograph of a light-emitting switch. The spot of light is about 0.0006-inch in diameter.

—Courtesy General Electric

ting diodes are very much brighter than many other sources, operate at power levels that are compatible with integrated circuits, possess a very long life, and can be fabricated in very dense arrays.

Not long ago, a new kind of light-emitting device was discovered that retains all of the common features of light-emitting diodes. In addition, the new device, called the Light-Emitting Switch (LES), is bi-stable and therefore has an inherent memory. The light output of the switch emanates from a small spot so that its brightness is considerably higher than conventional light-emitting diodes, which are themselves very bright. Finally, the light-emitting switch has a higher reverse break-down voltage than the diode.



This G.E. light-emitting switch produces a bright image with a contrast ratio exceeding 1000 to 1. This display consists of 400 devices and is only about 2 inches square.

—Courtesy General Electric

Light-emitting diodes and switches have been fabricated on chips of gallium arsenide, gallium arsenide phosphide, and other semi-conductor compounds. The row and column conductors are also included on the chip. The technology for making chips of this material larger than about 1-inch square does not yet exist. At the present time, the maximum size of a single, monolithic array is 1-inch square. There are methods, however, to bond many of these small arrays together to produce larger displays.

The most promising immediate potential for light-emitting diodes and switches is in applications where small displays are required, such as alpha-numeric modules or computer switch indicators. They are particularly attractive for use with integrated circuits since the voltage needed for the light-emitters is approximately the same as required by the circuits. One such application is a desk-top message center that would record incoming calls and messages when a person is away from his desk.

Displays made of light-emitting diodes and switches have been under development for several years. The technology is further advanced in the area of the infrared-emitters, since they were discovered before the visible devices. However, most of the techniques that apply to infrared seem to apply also to the visible so that the gap should narrow quickly.

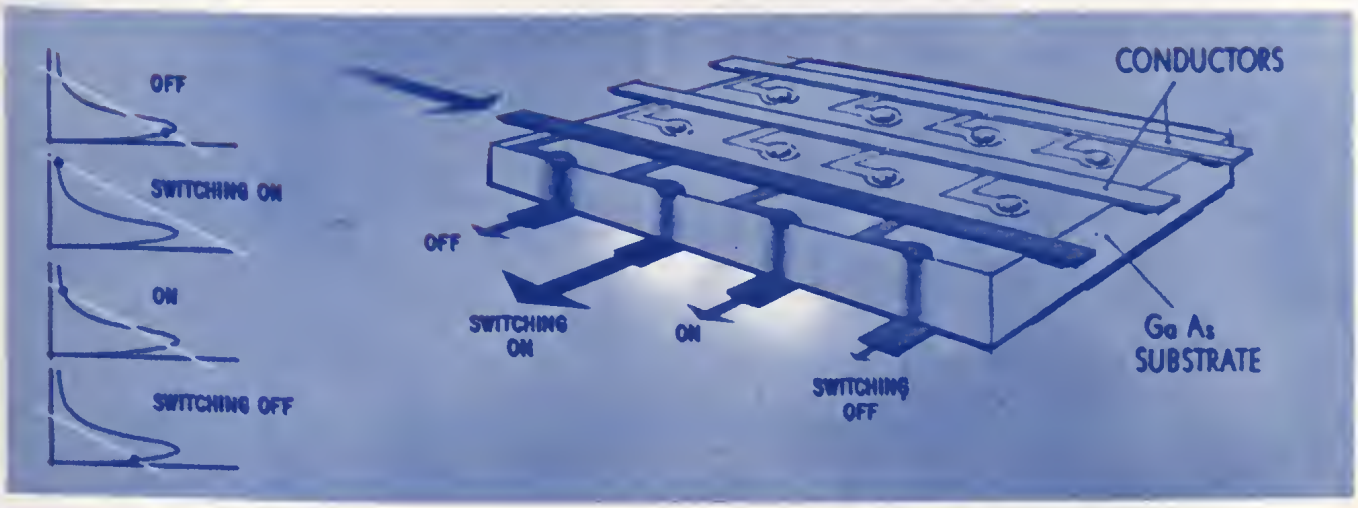


Diagram showing an array of light-emitting switches.

—Courtesy General Electric

ORGANIZATIONS NEWS

ENGINEERS' WEEK REPORT

The traditional Open House of the S.E.A.S. will again be held during National Engineers' Week this year, February 22-28, 1970. In conjunction with the Open House, industrial concerns and government agencies are invited to exhibit their contributions to modern technology and the Engineering Profession.

The theme for Engineers' Week this year is, "Engineering . . . Environmental Design for the 1970's." The goal for the Open House is to acquaint our visitors with the many facets of the Engineering Profession and to attract students to an engineering career.

The sponsoring organization of National Engineers' Week is the National Society of Professional Engineers. The official announcement of the theme by the society "pointed up the fact that the protection of our living space and natural environment is one of the most vital requirements of the decades ahead. We need to assure for all Americans safe, healthful, productive and aesthetically and culturally pleasing surroundings. The broad scope of environmental problems and the increasing impact of technology in the next decade places a tremendous challenge before the Engineering Profession — to understand and evaluate the social, ecological, and esthetic impacts of our work on society and its inhabitants.

"During this National Engineers' Week it is a good time to call attention to what the 1970's will mean for man, his technology, and his environment. This decade will see a major turning point in how we use technology to help protect and conserve our environment. Professional engineers in the 1970's are going to design machines and systems in which people and their human needs are part of the equation. Engineering will be in the center of the environmental action as we move into the 1970's . . . engineers will point toward creative technical design – but only under conditions that protect and preserve our wildlife, our rivers, lakes and seashores, our whole living environment. For these are the people who will design a significant part of the heritage which America will pass on to the next generation."

Over two-hundred invitations to participate were sent out to industry and government agencies. So far, about fifteen commitments to participate have been received. Of particular interest will be the exhibit that has been promised by the Goodyear Tire & Rubber Co.

Currently involved in trying to solve the mini-distance transportation problem — the moving of large numbers of people over very short distances, such as through large buildings and between parking lots and buildings – Goodyear is now building a working model of a system currently under consideration to solve many of these problems. It is a wait-less transportation system made up of passenger cars moving on what could be described as a race track-shaped conveyor belt. In straight aways, the cars travel 15 miles per hour or more, but at loading and exit points on the end curves, speed is only about 1½ miles per hour. People board the cars in motion from a traveling sidewalk moving at the same speed as the cars. Thus no waiting.

STUDENT DISPLAYS

A new feature I hope to incorporate into the 1970 Engineers' Week Open House will be a students' Projects Exhibit. Displays will have to demonstrate engineering in practice and should trace out the project from design through fabrication, preferably with photographs or prototype models as well as in written form. For projects involving only design or analysis, a graphic display of project definition and the steps towards completion would be suitable.

I hope many of you will take advantage of this opportunity to show your engineering know-how at this event and help make it possible.

–J. Marshall Azrael

THETA TAU FRATERNITY

The Fall Semester saw the resumption of Theta Tau activity under new leadership. Our new officers were elected in May 1969; they are:

Don Wallroth	Regent
Greg Eichert	Vice-Regent
Steve Momii	Treasurer
Howard Kellman	Recording Secretary
Michael Rothschild	Corresponding Secretary

Our Fall Activities started with pledge rush. Several parties were held and initiation was held on 2 November 1969. The following engineers are in the Fall Pledge Class:

Ray Grant*	Bill Zeeman
Jeff Davis	Dan Holtzclaw
Victor Kit	Frank Atwood
Jim Thomas	Lars Pardo
David Sobel	

*President of Pledge Class

Continued on page 32

3 flops and 1 wild success from GT&E research.

Let us be the first big corporation in America to admit it:

Sometimes we fall flat on our face.

That may come as a shock to you, but we've found it's a smart way to run our research laboratories.

Rather than saddle our scientists with a "Do It The Way It's Always Been Done" philosophy, we encourage them to stick their necks out—to poke around in places nobody ever poked around before.

Sometimes this philosophy makes millions of dollars for us (see Eureka!).

Sometimes it doesn't make us a penny.

Take, for instance

Flop#1: The Wam-O-Scope—a new kind of radar set that was supposed to be 10 times more sensitive than ordinary radar. (This was because we put lots of little electronic parts right inside the radar tube, where nobody ever put them before.) Theoretically, it worked fine. Practically, it didn't work at all. Which brings us to

Flop#2: The Stacked Tube. After years of work, we perfected the world's best radio tube—long lived, practically indestructible. Unfortunately, we built it the same year the transistor was invented, making our tube instantly obsolete. Then there was

Flop#3: The Omegatron—a clever device designed to tell vacuum tube manufacturers precisely how much excess gas they had in their tubes (which, you remember from Physics 1, are supposed to be completely empty). This, however, was more than they wanted to know. They wanted to get rid of the gas, not measure it. So finally, we come to

Eureka!

The Sylvania Flashcube—a little idea that revolutionized the whole camera business. For the first time, people could take flash pictures as fast as they could click the shutter—no more hot bulbs to change, no more missed pictures.

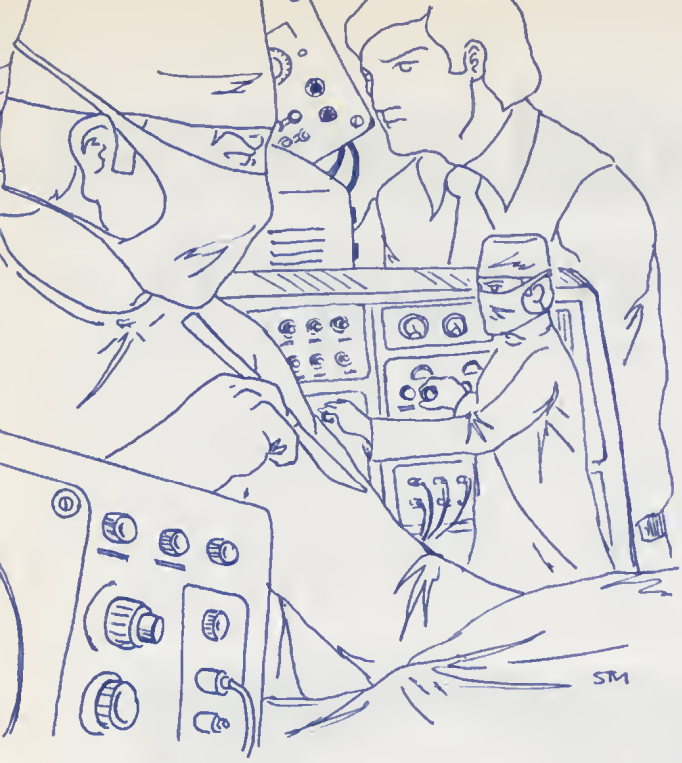
It looks simple. But it took more than 100,000 designs and years of fiddling and testing before we made the first one.

What are we up to now? Everything from laser research to pollution control.

We even have an idea that might revolutionize the entire color TV industry.

If it works.

General Telephone & Electronics



MEDICAL ENGINEERING

Peripheral Vascular Clinics: A Satellite Concept

Edited by Jorge Aunon

The George Washington University has been awarded a three-year grant from the Regional Medical Programs to initiate a series of clinics in the Washington Metropolitan Area for the purpose of improving care of patients who suffer from peripheral vascular problems. The grant is in the amount of $50,000 for the first seven months, and $90,000 for each of the next two years.

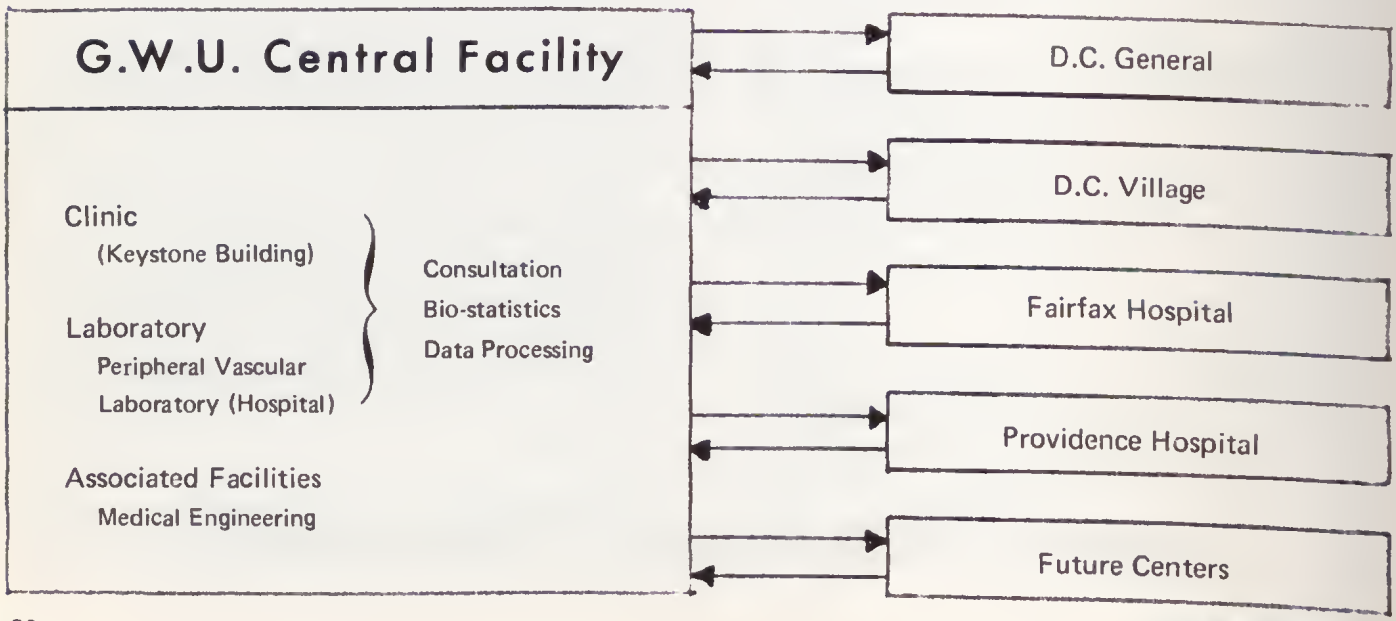
The Regional Medical Programs, a branch of the Department of Health, Education, and Welfare, is a country-wide program designed to bring the latest developments in medicine to a practical operating level for the benefit of the patient.

Peripheral vascular disease means any disease or disorder of the blood vessels outside of the heart and peripheral to the central body cavities. Thus, painful legs due to poor circulation when walking is a form of peripheral vascular disease.

The principal investigator in this grant is Dr. Juan B. Calatayud, and co-investigator is Dr. Richard C. Fowler, both of the Department of Medicine of the University Medical Center.

The George Washington University will operate as a central facility and will cooperate with several health care centers in this area.

Participating institutions will be: Providence Hospital, Fairfax Hospital, D.C. General Hospital, and D.C. Village.



MEDICAL ENGINEERING:
An Integrated Part of the Project

Two "breadboard" devices that resulted from the Summer Institute for Biomedical Research (*Mechelecív*, October '69) will be utilized in this grant.

Correct medical diagnosis of peripheral vascular disease is dependent on an accurate report by the patient of his daily activities. Thus, a physician has to rely upon a patient's accuracy in relating symptoms and activities. A device portable enough to be carried by a patient, which could quantitate this activity, would therefore be invaluable for correct diagnosis. An initial prototype was built this summer; miniaturization is the next step.

Another possible use of this "activity monitor" is to try to correlate this daily activity to the environmental conditions of the patient in his everyday living.

A second device will use ultrasonic techniques to detect motion in the blood vessels. The output of an ultrasonic device based on the Doppler shift is associated with the detection of motion. Whether this is lateral motion of the blood vessel, actual blood flow, or both, is a matter for further investigative effort. The importance of this method lies in that "non-invasive," that is, "non-surgical" techniques are utilized in assessing the actual condition of blood vessels. This device is currently in use in the peripheral vascular clinic at the George Washington University.

Dr. Marvin F. Eisenberg provides medical engineering consultations to the project, with Dr. Terry Ireland, from the Department of Statistics, in a consultative capacity as bio-statistician.

MEDICAL ENGINEERING NEWS

The 1970 Annual Conference on Engineering in Medicine and Biology will be held in Washington, D.C., November 15-19.

Dr. Antoine Remond of the Laboratoire d'EEG et de Neurophysiologie Apliquee, Paris, France, published a series of three articles in the EEG Journal (Vol. 26, 1969) on the Alpha Average. These are interesting, from the point of view of current gradients and topographical analysis.

The Association for the Advancement of Medical Instrumentation (A.A.M.I.) will hold its Fifth Annual Meeting in Boston, March 23-25, 1970. The general theme of the meeting will be *Automated Patient Care.* Deadline for submission of abstracts is December 1, 1969.

Yogis practicing "Ray Yoga" claim that during "samadhi" (meditation), they are oblivious to "external" and "internal" environmental stimuli, although their higher nervous activity remains in a state of "ecstasy." Electroencephalographic studies (EEG Journal, 1961, Vol. 13, pp. 452-456) done on Yogis during samadhi, showed that a persistent alpha activity (generally associated with drowsiness), presumably self-induced, was present during the tests.

The Russians (Y.A. Kholodov, Academy of Sciences, U.S.S.R.), are doing a lot of work on effect of electromagnetic and magnetic fields on the central nervous system. NASA's Technical Translation #F-465, June, 1967, reports on this work.

Mr. Jorge Aunon has a B.S. in Engineering Science from the G.W.U. S.E.A.S., 1967, and an M.S. in Medical Engineering from the G.W.U. S.E.A.S., 1969. Mr. Aunon is a Doctoral candidate with a major in Medical Engineering. He is a medical engineer under the Automated Patient Monitoring Program and an Instructor in the Department of Clinical Engineering. His address is 2300 K St., N.W., Washington, D.C. and may be reached at 331-6836.

FOCUS—CONTINUED FROM PAGE 17

The problems resulting from an engineering student magazine are very small compared to the total benefits from this activity; this panel of deans emphatically believes in and supports the engineering student magazine.

FINANCIAL SUPPORT

Dean Ingersoll of the University of Southern California, who was present in the audience, commented that in the case of the *USC Engineer,* support is received from engineering alumni to help pay the cost of operation of the engineering student magazine.

Comments from the floor and from a previous survey indicate that there are almost as many different ways of supporting the engineering student magazine as there are magazines. Some schools allocate a certain percentage of the student activity fees to support the engineering college magazine. Nearly every magazine relies partially on advertising, and magazines which receive no support from a student activity fee rely more heavily on local advertising. A few magazines are heavily dependent on subscription and sales income.

There is also a variety of remuneration for the editor, business manager, and other staff members. The form of payment for their services ranges from full-tuition scholarships to a "thank you" at the end of the term. Some schools provide academic credit as an elective for staff members.

Dean Bolz also pointed out that guidelines are sought but that censorship is abhorred by the student staff.

As in any well-run organization, command recognition (from the dean in this case) is necessary for maximum results. The deans have to make the value judgment as to how much money they want to provide for this activity. As with any worthy endeavor, support must be provided if success is to be obtained.

I saw a movie last night. It was a heart-rending story of a girl who didn't have any boy friends 'cause she was only 16 . . . where she should have been 38.

* * *

The young attractive housewife was a bit surprised when her husband's best friend dropped by one afternoon and offered $500 to make love to her. Thinking that the extra money would come in handy, she led him into the bedroom and fulfilled her part of the bargain. Later that afternoon, her husband returned from work. "Did David stop by today?" he asked casually. "Yes, he did," she stammered. "Why do you ask?"

"Well," her spouse replied, "he was supposed to return the five hundred dollars I lent him last week."

ORGANIZATIONS NEWS—CONTINUED FROM PAGE 28

The pledges will be under the direction of Andy Williams, pledgemaster.

Following our theme of professionalism, Gamma Beta co-sponsored an engineering oriented lecture featuring Earl Angelo of the Goddard Space Flight Center.

In order to aid aspiring engineers with their courses, Brother David Forsyth has created a test file located in the D.H. House for all engineers.

As engineering is not all classes and lectures and in order to supplement school life, Gamma Beta also is sponsoring two football teams. One, an alumni team on Saturdays; the other, a team comprised of active brothers playing on Sundays. Both teams are doing well, with the Saturday team just missing first place.

Working with the S.E.A.S. Administration and Students, Theta Tau hopes to become an integral part of the School, benefiting both the students and the University.

STATEMENT OF OWNERSHIP, MANAGEMENT AND CIRCULATION
(Act of October 23, 1962: Section 4369, Title 39, United States Code)

Publisher: file two copies of this form with your postmaster
Postmaster: Complete verification on page 2
Form Approved, Budget Bureau No. 48-R009

1. DATE OF FILING: September 15, 1969
2. TITLE OF PUBLICATION: Mechaleciv
3. FREQUENCY OF ISSUE: Published six times per year (Oct., Nov., Dec., Mar., Apr., and May)
4. LOCATION OF KNOWN OFFICE OF PUBLICATION (Street, city, county, state, ZIP code): 731 22nd Street N.W. Washington, D.C. 20006
5. LOCATION OF THE HEADQUARTERS OR GENERAL BUSINESS OFFICES OF THE PUBLISHERS (Not printers): 731 22nd Street N.W. Washington, D.C. 20006
6. NAMES AND ADDRESSES OF PUBLISHER, EDITOR, AND MANAGING EDITOR

PUBLISHER (Name and address): Engineer's Council, G.W.U. 725 23rd Street N.W. Washington, D.C. 20006
EDITOR (Name and address): David R. Armstrong 105 South Fenwick Street Arlington, Virginia 22204
MANAGING EDITOR (Name and address): Kennath D. Dampier 6173 Hardy Drive, McLean, Virginia 22101

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2. MAIL SUBSCRIPTIONS	0	0
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